LYDSTON (JAS. A.)

A PETRIFIED EYE.

BY

JAMES A. LYDSTON, M.D., PH.D.,

FORMERLY PROFESSOR OF INORGANIC AND MEDICAL CHEMISTRY AND LECTURER ON DISEASES OF THE EYE AND EAR, CHICAGO COLLEGE OF PHYSICIANS AND SURGERY; FELLOW OF THE CHICAGO ACADEMY OF MEDICINE.

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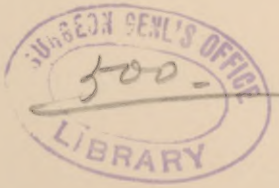
THROUGH the courtesy of Mr. George B. Davis, of Chicago, I am able to present to the Academy this evening a fossil that I believe presents a typical example of a petrified eye. The fossil was found at the mouth of Knife River, on the north shore of Lake Superior, in 1886, and was first cut by a Chicago lapidary, named Lyman. In order to demonstrate microscopically the arrangement of its parts, I had a second section made, which shows more clearly the structure of the petrified formation. The eye was first presented to me by Mr. Davis and a reporter for the *Inter-Ocean*, who handed it to me for an opinion. On superficial examination I strongly believed that it was a petrified eye, and so stated at the time, and now, after more exhaustively investigating the subject, I more fully emphasize this opinion. I have submitted it to the critical eyes of some of the most competent and expert lapidaries, and without exception the conclusion of

[1] Read before the Chicago Academy of Medicine, November 10, 1893.



these connoisseurs has been that nothing like it has ever fallen under their observation, and it seems that a single glance will convince even the most skeptical that, aside from the changes consequent upon petrifaction, it most closely approximates the structure of the human eye, and presents many analogous features.

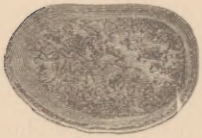
FIG. 1.

Posterior segment of eyeball.

FIG. 2.

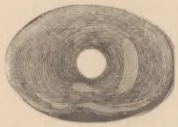
Anterior segment of eyeball.

FIG. 3.



Section showing interior structure.

FIG. 4.



Posterior view of anterior segment, showing lens, etc.

First, we have its outer layer, which conforms to the sclerotic or outer fibrous envelop of the eye, and apparently in keeping therewith we note that it is denser in its vitreous characteristics, and from the fact that its opaqueness renders its illumination impossible, it appears dark under the microscope just as a piece of chalk looks black when held in front of a flame. Lining this we find a somewhat darker pigmented layer composed of circular light and dark striæ, which answers to the choroidal or pigmentary

layer of the eye, and we can microscopically outline its several layers, and can even do so macroscopically under intense illumination with reflected light. We cannot define the retina as in its normal state, except its bloodvessels ; it is perfectly transparent, and is indistinguishable, and its structure so delicate that it has possibly been obliterated during the petrifactive changes. Furthermore, it is normally so closely approximated to the choroid that fusion would naturally ensue during the process of contraction and shrinkage consequent upon solidification. The vitreous humor or hyaloid body is found in a more or less crystallized form, with here and there darker pigmentary deposits, and prior to the final stages of petrifaction it is probable that the aqueous humor diffused itself throughout the vitreous, thus causing, in combination with the inorganic elements from filtration, a more or less definite crystalloid structure. In regard to the lens, it appears to have been pushed forward into the anterior chamber, and pressed against the iris, and seems to occlude the pupillary opening ; in other words, we have here a pretty illustration of occlusio pupillæ. The iris is shown in a somewhat typical manner, and displays itself in a mottled or tesselated form, which is quite noticeable in some irides. Its outlines are distinctly perceptible to the naked eye, and are still more conspicuous when inspected by means of transmitted light and a magnifying lens. We then see at the outer quadrant posteriorly a vacuole or air-chamber, which evidently answers to the junction of the anterior and posterior chambers of the eye, as in cases of displacement of the lens the

depth of the anterior chamber is greatly increased. Distinct traces of hematin or oxid of iron are to be seen diffused throughout the anterior portion of the eye, and at the latero-median junction of the iris and sclerotic is found a red discoloration, which, though probably due to a deposition of the oxids of iron and manganese, bears a marked semblance to a hyphemia, or effusion of blood into the anterior chamber.

I have searched the literature in the hope that I might find a similar case recorded, but my efforts have been futile. This, however, does not militate against the soundness of the conclusions reached. It may be argued that such a thing is preposterous in the extreme, but when we recall the fact that in certain pathologic conditions of the human eye we find calcareous deposits, ossification, and other changes, as, for example, in atrophied eyeballs following panophthalmitis, iridocyclitis, and other destructive inflammatory conditions, and we often meet in enucleation with hardened eyeballs closely resembling stone in their general characteristics—so hard, indeed, that it is almost impossible to make sections of them. I would also cite the changes supervening upon amyloid degeneration of the conjunctiva, it being a noteworthy fact that ossification and calcification occur in the later stages of this affection. We also find in cases of cataracta complicata that the lens assumes a calcareous form, and approximates stone in hardness; and still further, in zonular opacity of the cornea we have calcareous depositions.

Now it seems no more difficult that an eye should

petrify under the requisite conditions than that other parts of the human body which are just as prone to petrifactive changes should be thus metamorphosed, and we are aware that in rare instances the flesh, skin, and hair of an animal have been preserved for thousands of years, as in the case of the mammoths entombed within the frozen mud-cliffs of Siberia. In these instances the animal matter has been more or less completely mineralized or petrified.

The first question that naturally presents itself is: How are the remains of animals and plants preserved? The essential conditions are found only in cases in which the organic remains are protected from air and superficial decay—*e. g.*, over the bottom of lake deposits of silt, peat, marl, etc. Stems, branches, and leaves of plants, fruits, or seeds, may be carried into these places, as well as the bodies of land animals, insects, and birds; wild animals venturing on the more treacherous watery parts of a peat-bog are sometimes engulfed. The antiseptic qualities of the peat preserve such remains from decay until the more or less complete metamorphosis characteristic of petrifaction ensues. Hence from European peat-masses many remains of deer and oxen have been exhumed.

The history of the fossil presented to you is of such a nature as to lend all of the requisite conditions for petrifaction, and its characteristics wholly support such an assumption. I regard the fossil as a metamorphosed eye that has suffered a re-arrangement of its constituents, but with sufficient traces remaining to indicate its previous form and

structure. The mere presence of water by reason of its universal solvent action necessitates solution of some of the more soluble portions of the eye, and as condensation ensues they may be re-deposited in a new form. This is a possible explanation of the absence of some of the otherwise normal constituents of the eyeball. Most animal formations are derived from the lower grades of the animal kingdom, such as the mollusca, the actinozoa, and the foraminifera; and the explanation of the greater frequency of petrifaction of marine formations lies in the fact of their submarine habitat, their possession of resisting shells; and the mere fact of their food-supply, consisting as it does largely of crustacea and fish, is in itself a factor conducing to a deposition of lime-salts in their several structures, which would favor petrifaction. On the other hand, specimens from the land very seldom find lodgment in subterranean graves, unless they be twigs, leaves, etc., which are doubtless blown or carried by the winds, and, finding a watery grave, that predisposes to petrifactive changes, are accordingly metamorphosed and crystallized. Thus Kirwan says: "North of Quito there is a river that petrifies any kind of wood or leaves. The coral rock, though formed by continuous depositions of polyps, loses by degrees any distinct traces of organic structure, and acquires an internal crystalline structure by water-filtration through its mass, causing a deposition of lime carbonate, etc."

The eye may be that of a predatory animal, whose remains might readily find lodgment in a subterranean cavern, and thence be carried to a

watery bed. Thus the British carboniferous rocks have yielded thirteen genera of labyrinthodonts (anthracosaurus, loxomma, ophiderpeton, pholiderpeton, pteroplax, urocordylus, etc.). These were probably fluviatile animals of predaceous habits, subsisting on fish, crustacea, and other organisms of the fresh or salt waters of the coal lagoons, the largest types measuring from seven to eight feet in length.

In conclusion, I will add to the foregoing remarks that the reasons for styling the fossil a petrified eye may be expressed in the following:

1. Its history.
2. Its shape.
3. Its structure (showing as it does such a close analogy to the human eye).
4. Its appearance macroscopically and microscopically.
5. If it is not an eye, what is it?

I submit the question to your scientific minds for consideration.

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